Current Trends in the Treatment of Congenital Dislocation of the Hip

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Congenital dislocation of the hip (CDH) has intrigued physicians since the time of Hippocrates. Treatment continues to be an exacting challenge to the orthopedic surgeon. In spite of many advances in diagnosis and treatment, the etiology of CDH remains elusive and the incidence essentially unchanged. Over the past ten years all aspects of both surgical and nonsurgical treatment of CDH have been reevaluated.

Roser, in 1878, stated "Early treatment of hip joint dislocation is the main prerequisite of successful correction. I believe that many of these cases could be restored to normal if the condition was discovered neonatally and immediately treated with an abduction splint." This statement holds true today and early detection is the key in treatment of CDH. Children who have had their hips reduced before 6 months of age almost always develop a normal hip if avascular necrosis does not occur. In contrast, all children diagnosed after one year of age retain at least some roentgenographic stigma even with the most accurate treatment, which will almost certainly result in the development of osteoarthrosis during the usual life span.

Diagnosis

Screening in the newborn became popular in the 1950s. This has led to a significant decrease in the diagnosis of CDH in the older child, however, it does not decrease the incidence of CDH. In fact, Bennet et al have reported on the results of a 15-year study of hips in Southampton, England where they found a steady, statistically significant increase in the prevalence of CDH during the study period.3

In Sweden, the frequency of late diagnosed cases of CDH has increased during the past 20 years, despite well developed screening programs. Statistics from Sweden indicate that only approximately 50% of the cases of CDH are diagnosed in the newborn and a total of 80% by the end of the first 6 months of life.4 Wilkinson reported that in England, neonatal screenings and treatment failed to reduce the prevalence of unreduced dislocation in children over the age of one year.5,6

The diagnosis of CDH in the newborn has been by clinical examination. An experienced examiner is quite important as the findings are often quite subtle. Prospective studies have shown that at least 30% of patients with a delay in recognition have negative or equivocal tests for instability at birth.6 This emphasizes the necessity for repeat examination of the hips of every infant during well baby visits in the first year of life.

Special attention should be given to infants who have been identified as being at high risk for CDH at birth. Infants who should be considered at high risk include those with breech presentation, especially female infants. In a study of 25,000 infants, MacEwen and Ramsey found this combination of female babies in the breech position to result in CDH in one out of 35 births.7 A strong association exists between CDH and skull or facial abnormalities secondary to molding in utero.8 Fourteen percent of infants with congenital torticollis have hip subluxations or dislocations.8,9 A positive family history leads to an increased incidence up to 30%.10-12 Metatarsus adductus and talipes calcaneovalgus foot deformities also are associated with a higher incidence of CDH.8,13,14

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Hansson has identified another group of infants that must not be overlooked. The child with a birth weight below 2500 g or a child treated in an intensive care unit for other reasons is at high risk for late diagnosis of CDH. This is probably a result of the preoccupation with the more urgent treatment program.

Recent studies have demonstrated that real time ultrasound examination of infants' hips is an increasingly reliable and accurate method of diagnosing hip subluxations and dislocations. The cartilaginous femoral head and its relative position to the triradiate cartilage can be visualized as well as deformation of the capsular structures and the cartilaginous acetabulum. The technique for ultrasound examination for dislocation or subluxation is reliable for hips in infants up to the age of about one year. Sensitivity of real time ultrasound examination of the hip has been reported at approximately 90%.

Ultrasound examination has at times revealed an abnormal hip joint which was clinically and radiographically normal. Screening all newborn hips with real time ultrasound might eventually complement clinical examination in the routine diagnosis of CDH. At the moment, it is a helpful adjunct method in the diagnosis of a suspected problem.

The diagnosis of CDH in infancy remains a problem in that still many children are not diagnosed because of the lack of experience of the examiner or, in a significant percentage of children, the clinical methods of diagnosis are not reliable. The more extensive use of ultrasound by experienced physicians should reduce the problem of late diagnosis in the future.

Treatment

Conservative management has played an increasing role in the treatment of CDH. This has largely been due to the earlier diagnosis of the problem. While it has been accepted that children under one year of age can be managed by nonoperative means, a recent study by Zions and MacEwen added further support to the closed treatment for children under 3 years of age. They observed continued acetabular development, in the absence of subluxation, for as long as 6 years after reduction. This potential of acetabular recovery for significant periods of time after closed reduction has also been reported by Harris et al. The secondary femoral or acetabular procedures were performed whenever subluxations became apparent. They did not recommend routine secondary procedures as advocated by some authors as 34% of the hips that were treated by closed reduction did not require a subsequent femoral or acetabular procedure. Avascular necrosis developed in only 2.6% of hips that were treated by closed reduction in this series.

The methods of traction for CDH have changed. There is a trend away from the use of skeletal traction with its attendant risks of epiphysseal plate injury, fracture, and infection all related to the pin site.
Home skin traction has been used as an alternative to hospitalizing children for traction. In a review by Voutsinas et al., the results of a home traction group treated with closed reduction were comparable to an inpatient group. The incidence of avascular necrosis and number of successful closed reductions were similar in both groups.

Open reduction for children under 2 years of age by the medial (Ludloff) approach has lost the popularity it had 10 years ago. Ferguson found a zero incidence of necrosis in 125 patients by approaching the hip posterior to the adductor longus tendon. Weinstein described a medial approach which proceeds anterior to the pectineus to expose the hip capsule and reported three subluxations and two instances of necrosis in 50 hips. An updated review of an additional 55 hips has yielded no other instance of avascular necrosis (Weinstein SL, personal communication, 1984). However, enthusiasm for the medial approach has waned at many centers due to high rates of persistent instability requiring secondary procedures and significant incidence of avascular necrosis (in excess of 50% in some series). Open reduction is indicated when closed reduction fails. Failure includes: inability to achieve a concentric reduction, inability to achieve and maintain reduction without placing the affected limb in an unphysiologic position, inability to successfully place the femoral head in the acetabulum, and an unstable reduction, whenever the hip can be reduced, but is unstable in any position.

During open reduction, the management of the limbus continues to be a controversial subject. Ponteit has demonstrated that the effects of the limbus (labrum) as seen on arthrogram is frequently a ridge in the articular cartilage of the acetabulum, created by pressure from the femoral head, rather than a true inverted labrum. When there is an inverted labrum, it covers a similar bulge in the acetabular cartilage histologically. In either case, this acetabular cartilage has growth potential. Both Salter and Benson suggest that the long-term results of open reduction are better if the labrum is not excised. It is considered prudent in most cases to leave the labrum in place and allow remodeling to occur through superiorly directed pressure from the reduced femoral head. In those instances where the labrum is an obstruction to reduction, the labrum may be everted following radial cuts around it's circumference.

The management of an untreated CDH in the child over 3 years of age remains a formidable challenge. By this time, there is adaptive shortening of the periarticular structures, with significant structural alterations in both the femoral head and acetabulum. The majority of these hips require open reduction. However, it must be recognized that open reduction is always a difficult procedure, especially in a child over 3 years of age. Currently, the trend is to avoid the use of preoperative skeletal traction, as advocated by Crego, with its attendant risks of necrosis, redislocation, and stiffness. Schoenecher and Strecker reported a 54% incidence of aseptic necrosis and a 31% redislocation rate with the usual skeletal traction in patients greater than 3 years of age.

In comparison, open reduction combined with femoral shortening markedly reduced the problem of avascular necrosis, but had an incidence of redislocation of 8%. Coleman (personal communication, 1984) observed an 8% incidence of avascular necrosis in his series of femoral shortenings. Similar results with open reduction and femoral shortening have been reported by several other investigators. However, it should be noted that although femoral shortening facilitates reduction and decreases the potential for complications, it increases the difficulty of the surgery significantly. A pelvic osteotomy should rarely be undertaken at the time of open reduction and femoral shortening. Time should be allowed for maximum acetabular recovery and demonstration of concentric reduction.

**Reconstructive Procedures**

Secondary femoral or acetabular procedures are indicated if subluxation is present. Arthrographic evaluation of the hip with questionable subluxation has been a significant step forward in making an accurate diagnosis of subluxation and the need for a secondary procedure. The goal of these operations is to provide a stable, concentric reduction in the weight bearing position in order to optimize the development of the hip joint with subsequent growth. Controversy remains as to which side of the hip joint should be addressed in persistent acetabular dysplasia. Kasser et al believe that changing the configuration of the proximal end of the femur to redirect the force on the acetabulum facilitates acetabular improvement. They reported good and excellent results in 13 of 16 hips that were treated with femoral varus derotation osteotomy in children who were less than 5 years old. In patients who were older the
procedure was much less reliable. Similarly, Lloyd-Roberts stated that 4 years appears to be the critical age after which femoral osteotomy alone cannot be relied on to stimulate normal acetabular development. Salter, as well as Pemberton, emphasized the anterolateral acetabular deficiency and recommended osteotomy of the ilium. Innominate osteotomy appears to be effective over a broader age range than the femoral osteotomy. Salter and Dubos reported “Severin class” I and II results in 81% of hips that were treated for residual subluxation by innominate osteotomy. Barrett et al recently reported their experience with the Salter innominate osteotomy. When evaluating the hips in which the procedure was done for persistent acetabular dysplasia after closed or open reduction, they had 73% of hips with Severin class I and II results. They also stated there was no noticeable difference between the results of innominate osteotomy combined with open reduction and those of innominate osteotomy performed after a previous open reduction.

Reconstructive procedures in the older child and adolescent are complicated by the lack of remodeling potential. The Salter innominate osteotomy is of use in this age group only when a mild acetabular dysplasia is present and requires minimal lateral coverage. Rab suggests that if a subluxated hip is unstable in 25° of flexion and 10° of abduction, a Salter osteotomy will fail to rotate the acetabular sufficiently to provide stability in the neutral position even in the younger child. In patients with more advanced dysplasia with limited mobility of the symphysis pubis secondary to skeletal maturity and who need mostly lateral coverage of the femoral head, the “Steel triple innominate” osteotomy is more effective. In a review by Kumar and MacEwen of triple innominate osteotomies, the center edge angle was improved from an average of 5° prior to surgery to an average of 30° after operation. Symptoms of pain and limping were improved without further restriction of motion.

There has been increased interest in salvage procedures in the adolescent and young adult as total hip arthroplasty has not yet statistically yielded good long-term results in the younger age groups. The indications for a salvage procedure are a painful hip that is not deeply seated in the acetabulum. The shelf operation is designed to increase the volume of the acetabulum. At least 50% of the weight bearing surface should be contained by the existing acetabulum. Wainwright and Love et al reported excellent relief of pain in over 75% of their patients with a shelf procedure. The Chiari osteotomy is the other commonly employed salvage procedure. The deficient acetabulum is deepened by medial displacement of the distal pelvic fragment. Coverage of the femoral head is improved under the lateral pelvis with interposed capsule. Mitchell reported satisfactory relief of pain in 85% of his patients. Betz reviewed 24 patients and found good or excellent results in 89% of the patients at an average follow up of 8 years. Bailey and Hall reported satisfactory coverage, pain relief, and increased function in 15 of 16 osteotomies performed for congenital hip dysplasia.

**Avascular Necrosis**

Avascular necrosis remains the most common, serious complication of the treatment of CDH. Increasing interest in this problem is evident by the number of recent reports in the literature. These have resulted in classification of the problem, and specific changes in management of CDH, to reduce the problem, as well as treatment recommendations for the hip that has had a vascular insult recognized after treatment for CDH.

It is now recognized that the Lorenz or “frog leg position” with 90° each of flexion and of abduction is associated with a significantly increased risk of avascular necrosis. Studies have shown the position to interfere with the blood supply of the proximal femoral epiphysis in both experimental animals and human infant cadavers. Flexion of the hips greater than 90° will usually redirect the femoral head toward the interradial cartilage without risk to the blood supply to the epiphysis and avoid the dangers of excessive abduction. Skin traction is now routinely used prior to closed reduction. It has been shown that this reduces the incidence of avascular necrosis or at least avoids the more serious types. In contrast, the use of skeletal traction has decreased. It is felt that the increased distraction forces with skeletal traction may lead to increased pressure on the femoral head once reduction is achieved and the traction is released.

If avascular necrosis develops during treatment of CDH, the radiographic changes are usually identifiable within 2 years. Several classification systems have been defined, generally based on the extent of vascular insult. While these classification
systems are helpful in predicting potential problems, there is still significant variability in the developmental changes that occur. Treatment following a vascular insult to the hip should be aimed at the specific problems that can occur; femoral head deformity, acetabular dysplasia, lateral subluxation of femoral head, relative overgrowth of the greater trochanter, and limb-length inequality. 66 Reconstructive procedures for these problems are usually more difficult and the results less predictable. Close follow-up of the development of hip until skeletal maturity is necessary.

Summary

The best results in CDH are after early diagnosis and treatment. More carefully taught examination techniques of the newborn are important. With the addition of ultrasound examination of the hip, the number of children with CDH diagnosed in the newborn period should increase. The Pavlik harness has had increased use in the child up to 6 months of age. It allows a simple reduction technique for approximately 90% of these children. If skillfully used, the risk of avascular necrosis can approach zero. The early gentle reduction will improve the results of treatment in avoiding avascular necrosis. Skin traction, the human position during the application of a cast, and femoral shortening at the time of open reduction in the child over 3 years of age also contribute to the decreased incidence of avascular necrosis. The early recognition of even the minor forms of subluxation and the treatment with proximal femoral or acetabular procedure is important. This program should increase the number of children reaching adulthood with a concentrically reduced painless hip.

References


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